REMARKS

Summary of Amendments

1. Claims 1 through 16 were originally presented in this application. Claims 17 through 20 were added by a previous amendment in response to a first, non-final office action. Claims 3 and 7 were canceled without prejudice by a previous amendment in response to a second, non-final office action.

   By the present amendment, no new claims have been added, claims 1, 9, 11, and 15 have been canceled without prejudice, and claims 2, 4, 17 and 18 have been amended. Claims 2, 4, 5, 6, 8, 10, 12-14, and 16-20 remain pending.

Rejections under 35 U.S.C. § 112

2. Claims 11, 15, 17, and 20 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as their invention. Regarding claims 11 and 15, the Examiner states: "claims 11 & 15 depend from a cancelled claim, rendering them indefinite." Regarding claims 17 and 20, the Examiner states" claims 17 & 20 appear to be the same as claim 1 and 19 respectively, rendering them indefinite."

3. Claims 11 and 15 have been canceled in this paper.

4. Applicants respectfully traverse the § 112, second paragraph rejection of claim 17. Currently amended claim 17 is distinct from claim 4 (which now includes each of the elements of previously presented claim 1) in that it recites a compound thin film deposited by a "cathodic-arc deposition method." In contrast, claim 4 recites a compound thin film that is "vapor deposited" on the base material.

5. Applicants respectfully traverse the § 112, second paragraph rejection of claim 20. Claim 20 is distinct from claim 19 in that it recites a hard carbon thin film deposited by a "cathode arc deposition method." In contrast, claim 19 recites a hard carbon thin film deposited by a "physical vapor deposition method." Moreover, claim 19 is further distinct from claim 19 in that it recites a hard carbon thin film having a thickness ranging from 0.05 to 3 μm. In contrast, claim 20 includes no such thickness limitation.

Claim Rejections - 35 U.S.C. § 102

Claims 1, 2, 4, 17 and 18; Nakamura et al. '957

6. Independent claims 1, 17, and 18 stand rejected under 35 U.S.C. § 102(e) as being anticipated by *Nakamura et al.* (U.S. Pat. No. 6,565,957). In particular the Examiner states: "Nakamura et al. discloses the claimed coating (claim 8) having the claimed compressive stress (claim 3) and thickness (column 3, line 61) on the claimed substrate (table 1). The substrates are honed to the claimed roughness (column 4, line 56)."

7. Claim 1 has been canceled. Claim 4 has been amended to include each of the elements of previously presented independent claim 1, from which it previously depended. Independent claims 17 and 18 have also been amended to include the limitation recited in original claim 4. These amendments are supported by the originally and previously presented claims such that no new matter has been entered and no new search is required.

8. Applicants respectfully submit that, as amended, claim 4 now distinguishes patentably over *Nakamura et al.* Original claim 4 recites "said compound thin film is surface roughness adjusted to be 0.01 μm or more and 0.5 μm or less by indication Ra." Nothing in *Nakamura et al.*, or any other prior art reference of record, teaches or in any way suggests a compound thin film that is surface-roughness adjusted to the above range of Ra values. On the contrary, as the Examiner has noted in her rejection of claim 4 in the present, final Office action, *Nakamura et al.* teaches a cutting tool having a substrate that is honed to a surface roughness of R: 0.05 (column 4, line 56). *Nakamura et al.* further disclose depositing a compound thin film on the honed substrate (column 5, lines 1 through 49). There is no disclosure in *Nakamura et al.* of honing the compound thin film.

9. Furthermore, it is well known to those of ordinary skill in the art that, by their very nature, thin film deposition processes (such as vapor deposition and cathodic-arc deposition) typically produce thin films having a high (i.e., poor) surface roughness. Honing (or polishing) the substrate prior to deposition of the thin film, as taught by *Nakamura et al.*, does not necessarily result in a deposited compound thin film having a surface roughness in a desirable range (such as the range of 0.01 to 0.5 μm as recited in amended claims 4, 17, and 18). Thus, as amended, claims 4, 17, and 18 are clearly distinct from Nakamura et al. in reciting a compound thin film having a surface roughness in the range from 0.01 to 0.5 μm Ra. Applicants, therefore, respectfully submit that, as amended, independent claims 4, 17, and 18 are allowable. It follows that dependent claims 2, 10, and 12 must also be allowable, since they ultimately depend from allowable claim 4.

Claims 1, 2, 17 and 18; Braendle '379

10. Claims 1, 2, 17, and 18 stand rejected under 35 U.S.C. § 102(e) as being anticipated by *Braendle* (U.S. Pat. No. 6,395,379). Applicants respectfully submit that this rejection is rendered moot in view of the amendments to claims 4, 17, and 18 and the remarks set forth above in paragraphs 7 through 9.

Claims 1 and 17; Mitsubishi Materials JP '740

11. Claims 1 and 17 stand rejected under 35 U.S.C. § 102(b) as being anticipated by *Mitsubishi Materials* (JP 05-285740). Applicants respectfully submit that this rejection is rendered moot in view of the amendments to claims 4, 17, and 18 and the remarks set forth above in paragraphs 7 through 9.

Rejections under 35 U.S.C. § 103

Claims 10-12; Nakamura et al. '957

12. Claims 10 through 12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the Nakamura et al. cited in making the § 102 rejections of claims 1, 2, 4, 17 and 18 addressed above. Claim 11 has been canceled. Applicants respectfully submit that claims 10 and 12 must be allowable since they ultimately depend from allowable claim 4.

Claims 5, 6, 8, 9, and 13-16; Grotepass et al. '444

13. Claims 5, 6, 8, 9, and 13 through 16 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Grotepass et al.* (U.S. Pat. No. 5,376,444). In particular, the Examiner states: "Grotepass et al. disclose that a diamond layer may be put under compressive stress by an additional layer (column 3, line 68 – column 4, line 1) on a substrate that may be cutting substrate. It would have been obvious to one of ordinary skill in the art that the specifics of the claimed substrate and claimed physical properties of the coating are obvious design choices, as these conditions are known in the cutting art to provide improved performance of tools."

14. Applicants respectfully traverse this rejection. As previously presented, independent claim 5 is believed to set forth non-obvious subject matter over *Grotepass et al.*, whether viewed independently, or in combination with any other reference of record in this application. Previously presented independent claim 5 recites a surface-coated machining tool comprising "a cemented-carbide base . . . and a hard carbon thin film made up essentially of carbon atoms only coated to a given thickness over said cemented-carbide base material." Claim 5 further recites that the hard carbon thin film is coated

> by a physical vapor deposition method . . . and under gas pressure, base material bias voltage, and deposition-temperature conditions that, together with said given thickness, are predetermined so as to impart a compressive stress of 0.1 GPa or more and 8GPa or less to said compound thin film.

15. *Grotepass et al.*, on the other hand disclose a surgical tool, such as a dental burr, comprising a coating of artificial diamond particles mounted in or bonded to a substrate. The diamond particles are further coated with a thin protective layer, such as a TiN layer, exhibiting a compressive residual stress. The protective coating is intended to prevent diamond particles from becoming dislodged from the substrate or fractured along cleavage planes during use of the tool (column 2, lines 16-20). *Grotepass et al.* in no way teach or suggest a machine tool having the structure recited in claim 5 (and in paragraph 14 above). On the contrary, claim 5 sets forth non-obvious subject matter over *Grotepass et al.* for at least two distinct reasons.

16. First, *Grotepass et al.* do not teach or even suggest a machining tool comprising a hard carbon thin film as recited in claim 5. On the contrary, as stated above in paragraph 15, *Grotepass et al.* teach a structure in which diamond particles are bonded to or formed on a substrate. That *Grotepass et al.* teaches diamond particles in contrast to a hard carbon thin film, as recited in claim 5, is abundantly clear, as the *Grotepass et al.* specification is replete with references to "diamond dust" and "diamond particles." Moreover, *Grotepass et al.* further clearly states:

> The expression "diamond coated surfaces" as used in this specification is intended to cover both "diamond inset" surfaces . . . and is specifically intended to also embrace surfaces onto which a coating of artificial diamond particles have been formed by the industrial process known in the trade as chemical vapor deposition (CVD)

(column 1, lines 26-31, emphasis added). Again, there is no suggestion of a hard carbon film (i.e., a continuous layer) as recited in claim 5. In clear contrast to a film, *Grotepass et al.* teaches diamond particles embedded in or formed on a substrate. The use of such diamond particles may be fairly said to teach away from the hard carbon thin film recited in claim 5. Accordingly, the artisan of ordinary skill would not have looked to *Grotepass et al.*

17. Second, *Grotepass et al.* does not teach or even suggest a hard carbon film having a compressive residual stress therein as recited in claim 5. Applicants point out that claim 5 recites a compressive residual stress. A residual stress is defined as a stress that remains in a material without the application of any external force. Such residual stress in the present invention is generated

internally in the thin carbon film (i.e., via internal strain on the lattice). Claim 5 further recites that the compressive residual stress is produced by the physical vapor deposition process used to form the hard carbon thin film and thus depends on the deposition conditions utilized (i.e., gas pressure, substrate bias voltage, deposition temperature, etc.). On the contrary, as stated above, *Grotepass et al.* teach diamond particles embedded in or formed on a substrate. That there is no compressive residual stress in the diamond particles is abundantly clear from the fact that *Grotepass et al.* teach a TiN protective layer (having a compressive residual stress) deposited over the diamond particles. The purpose of the protective layer is to externally "exert a compressive stress on the individual coated diamond particles" (column 3, line 68 through column 4, line 1). Such a protective layer that externally exerts a compressive stress on the diamond particles clearly teaches away from the compressive residual stress recited in claim 5. Accordingly, the artisan of ordinary skill in the art would not have looked to *Grotepass et al.*

18. Moreover, Applicants respectfully submit that *Grotepass et al.* is not sufficiently pertinent to the particular problem faced by Applicants as to reasonably suggest the present invention as recited in claim 5. In fact, *Grotepass et al.* show no recognition of the problem faced by the Applicants, namely that of reducing breakage in router cutters and drills used in machining semiconductor wafers. On the contrary, *Grotepass et al.* is primarily concerned with reducing the diamond particle fallout and fracture in a surgical cutting tool (column 2, lines 16-20).

19. In sum, *Grotepass et al.* is void of any suggestion of a machining tool comprising a hard diamond film having a compressive residual stress. Moreover, *Grotepass et al.* clearly teaches away from such a construction as described above in paragraphs 16 and 17. Accordingly, Applicants submit that previously presented independent claim 5 is patentable over the prior art of record. It follows that dependent claims 6, 8, 13, 14, and 16 must also be allowable, since they ultimately depend from allowable claim 5.

20. It is noted that independent claims 19 and 20 were not rejected in view of any of the prior art of record in the present Office action. If the Examiner intended to reject claims 19 and 20 over *Grotepass et al.*, Applicants respectfully submit that claims 19 and 20 are patentably distinct over *Grotepass et al.* for the same reasons with regard to claim 5 as described above in paragraphs 14 through 19. In particular, it is noted that, in common with claim 5, claims 19 and 20 both recite a hard carbon thin film having a compressive residual stress of 0.1 to 8 GPa. Applicants therefore submit that claims 19 and 20 are also patentable over the prior art of record.

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Applicants believe that this application in now in full condition for allowance, which action Applicants earnestly solicit.

Respectfully submitted,

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James W. Judge
Registration No. 42,701

JUDGE PATENT FIRM
Rivière Shukugawa 3rd Fl.
3-1 Wakamatsu-cho
Nishinomiya-shi, Hyogo 662-0035
JAPAN

Telephone: **305-938-7119**
Voicemail/Fax: **703-997-4565**